



(51) International Patent Classification:

H04B 3/54 (2006.01) *H04L* 12/403 (2006.01)
H04L 12/28 (2006.01) *H04L* 12/56 (2006.01)

(21) International Application Number:

PCT/JP2008/073979

(22) International Filing Date:

26 December 2008 (26.12.2008)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/019,052 4 January 2008 (04.01.2008) US
 61/022,251 18 January 2008 (18.01.2008) US

(71) Applicant (for all designated States except US): **Panasonic Corporation** [JP/JP]; 1006, Oaza Kadoma, Kadoma-shi, Osaka, 5718501 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **GALLI, Stefano. KUROBE, Akio. OHURA, Masato.**

(74) Agents: **OGURI, Shohei** et al.; Eikoh Patent Firm, 7-13, Nishi-Shimbashi 1-chome, Minato-ku, Tokyo, 1050003 (JP).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

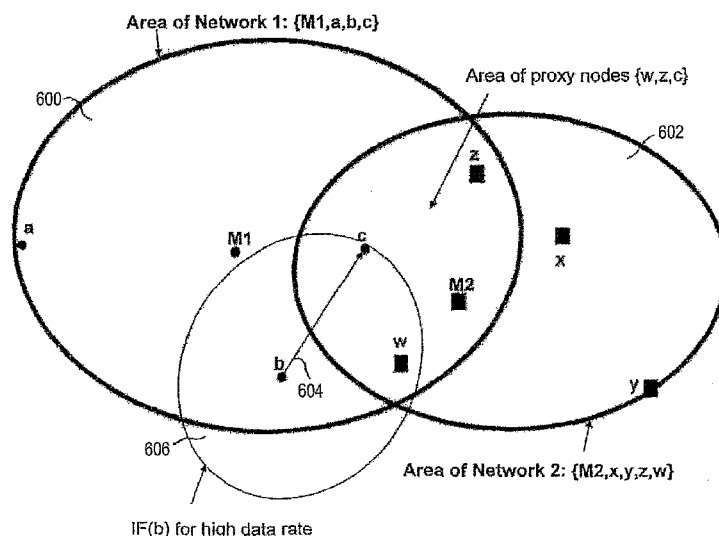
— with international search report (Art. 21(3))

(88) Date of publication of the international search report:

21 January 2010

(54) Title: METHOD, SYSTEM, INTEGRATED CIRCUIT, COMMUNICATION MODULE, AND COMPUTER-READABLE MEDIUM FOR ACHIEVING RESOURCE SHARING INCLUDING SPACE AND TIME REUSE WITHIN A POWER LINE COMMUNICATION SYSTEM

FIG. 6



(57) Abstract: A communication system includes communication protocols that allow a single network or multiple neighboring networks to increase resource sharing and reduce mutual interference and increase their overall throughput. Various protocols apply to homogenous networks in which all power line communication (PLC) devices of multiple networks are interoperable with respect to full power line communication in a common PHY (specifications, signaling capabilities, modulation scheme, coding scheme, bandwidth, etc.) and to heterogeneous networks in which devices of some PLC networks are not interoperable with PLC devices of other PLC networks with respect to full power line communication given that the devices of the different networks do not employ a common PHY. With respect to heterogeneous networks, a protocol is provided to enable coexistence via a signaling scheme common to all of the devices of the network that allows resource sharing between the devices of the multiple heterogeneous networks. Homogeneous networks are those in which all nodes can communi-

cate with each other using a common PHY, so that information about one PLC network can be transferred to another PLC network. Heterogeneous networks are those in which not all PLC networks can exchange information using their own native PHY, such as where users in different apartments or houses use different devices having different specifications, different signaling capabilities, modulation scheme, coding scheme, bandwidth and the like.

INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2008/073979

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04B3/54 H04L12/28 H04L12/403 H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04B H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	EP 2 023 501 A (ABB TECHNOLOGY AG [CH]) 11 February 2009 (2009-02-11) abstract; figure 1 column 5, paragraph 19-22	1-8, 15-21, 23-25
X	US 2007/230498 A1 (FUJIWARA YUKI [JP] ET AL) 4 October 2007 (2007-10-04) abstract; figures 1,2,4 paragraphs [0026] - [0032]	1-8, 15-21, 23-25
	-/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

25 September 2009

Date of mailing of the international search report

05/10/2009

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Ricciardi, Maurizio

INTERNATIONAL SEARCH REPORT

International application No

PCT/JP2008/073979

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LIU Q ET AL: "CROSS-LAYER MODELING OF ADAPTIVE WIRELESS LINKS FOR QOS SUPPORT IN HETEROGENEOUS WIRED-WIRELESS NETWORKS" WIRELESS NETWORKS, ACM, NEW YORK, NY, US, vol. 12, no. 4, 1 January 2006 (2006-01-01), pages 427-437, XP001501634 ISSN: 1022-0038 the whole document	1-8, 15-21, 23-25
X	US 2003/123425 A1 (WALTON JAY R [US] ET AL) 3 July 2003 (2003-07-03) abstract paragraphs [0295] - [0299] paragraph [0307]	9-14,22, 27
X	US 2007/086408 A1 (KURODA GO [JP] ET AL) 19 April 2007 (2007-04-19) abstract paragraphs [0024], [0025], [0050] - [0054], [0131]	9,14,22, 27
X	US 2007/097960 A1 (KUROBE AKIO [JP] ET AL) 3 May 2007 (2007-05-03) abstract paragraphs [0025] - [0027], [0067] - [0072], [0100]; claims 1-4	9,14,22, 27

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/073979

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-8, 15-21,23, 24, 25

a power control method and corresponding apparatus for a power line communication system

2. claims: 9-14, 22, 26, 27

a resource allocation method in a communication channel, said method being based on space and time reuse.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2008/073979

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 2023501	A	11-02-2009	WO 2009019066 A1	12-02-2009
US 2007230498	A1	04-10-2007	CN 101416430 A	22-04-2009
			EP 2007047 A2	24-12-2008
			WO 2007114169 A1	11-10-2007
			KR 20090009816 A	23-01-2009
US 2003123425	A1	03-07-2003	AU 4937901 A	15-10-2001
			BR 0109639 A	24-06-2003
			CA 2404055 A1	11-10-2001
			CN 1432221 A	23-07-2003
			EP 1269654 A2	02-01-2003
			JP 2003530009 T	07-10-2003
			KR 20080026225 A	24-03-2008
			MX PA02009418 A	10-04-2003
			NO 20024635 A	22-11-2002
			TW 512602 B	01-12-2002
			UA 73979 C2	15-01-2003
			WO 0176098 A2	11-10-2001
			US 6493331 B1	10-12-2002
US 2007086408	A1	19-04-2007	CN 101268625 A	17-09-2008
			EP 1928104 A1	04-06-2008
			WO 2007034854 A1	29-03-2007
			KR 20080059172 A	26-06-2008
US 2007097960	A1	03-05-2007	EP 1933485 A1	18-06-2008
			WO 2007040203 A1	12-04-2007
			KR 20080054371 A	17-06-2008